NASA Procedural Requirements

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Subject: Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components

Responsible Office: Logistics Management Division

Chapter 2. Supplier Packaging Requirements

2.1 Selection of Packaging

2.1.1 Levels of preservation and packaging and the levels of packing to be applied selectively are defined in MIL-STD-2073-1 and are mandatory for use or when commercial packaging cannot provide adequate protection and preservation. Selection of levels shall be in accordance with the level selection chart Figure 1of MIL-STD-2073-1 and in Appendix A of this NPR. If military packaging is applicable, MIL-STD-2073 will further aid in the development of detailed requirements.

2.1.2 Selection of the levels of packaging and packing to be applied shall be the responsibility of the Center Transportation Officer unless levels are specified by the procuring activity.

2.1.3 Selection of the levels of packaging and packing shall depend on the modes of transport, environmental control, conditions and length of storage, and the anticipated requirements for redistribution.

2.1.4 When Level A or Level B packaging and/or packing is selected, the protective process, materials, and containers shall be in accordance with the requirements of MIL-STD-2073-1. NAS 850 and 851 may be considered for Level B application where the standard meets the requirements for that level.

2.2 Special Design Packaging

2.2.1 For those items possessing characteristics requiring special design packaging as defined in Appendix A, the contractor shall develop the necessary designs, maintain packaging engineering data in sufficient detail to permit necessary review, and implement the packaging specified therein.

2.2.2 Prior to developing a newly designed container, maximum effort shall be made to use container designs or containers from those already available commercially or from Government inventories (see sections 2.9. and 2.10.).

2.2.3 Specifically identified special design packaging may be screened through the Air Force Container Design Retrieval System (hereinafter called the System). Unless otherwise specified, search requests through the System shall be sent directly to Air Armament Center, United States Air Force Material Command, Eglin Air Force Base, FL 32542. (See appendix C for the Container Design Retrieval System Search Request Form.)

2.2.3.1 Each request shall establish a desired response date.

2.2.3.2 Pending timely response, the Transportation Officer shall withhold package container development.

2.2.3.3 When specified by the procuring activity, new design data and engineering drawings with specifications in accordance with MIL-STD-2073-1, shall be submitted as stated in the contract.

2.2.4 Candidates for screening through the System shall be selected on the basis of cost, schedule, and complexity of design and fabrication.

2.3 Package Engineering Documentation

2.3.1 For purposes of this NPR, unless otherwise specified by the procuring activity, package engineering documentation shall be required only for special design packaging. Contractor documentation forms may be used unless otherwise specified in the contract.

2.3.2 Submission and approval shall be in accordance with the Contract Data Requirements List or as otherwise authorized in the contract or by written direction of the contracting officer.

2.3.3 MIL-STD-2073-1 shall be used for guidance.

2.4 Environmental Analysis

2.4.1 The preservation, packaging, packing, and shipping techniques applied shall ensure protection of the contained item against the natural and induced environments to which it may be subjected. Analysis of these hazards is essential prior to item design and development of the packaging and shipping techniques to be applied.

2.4.2 The contractor shall ensure that design engineering provides item fragility, engineering drawings, and sensitivity data to packaging engineering, line packaging, and transportation personnel by completing an NASA Form 1426 (http://server-mpo.arc.nasa.gov/Services/NEFS/NEF_PDFData/NF1426.pdf) or equivalent.

2.4.3 The contractor's packaging and transportation engineers and/or technicians shall participate in equipment design efforts from the earliest stages. They shall:

a. Identify the ground handling, transport and storage environment requirements, including protection from contingency or emergency environments where the environmental analysis indicates that facility/carrier protection is more practical, reliable, or cost effective than providing the same protection by packaging and packing design

b. Prepare or identify testing programs; prepare packaging and transportation data for use in management's configuration documents c. Perform such other functions in the design effort as may be necessary or proper.

2.4.4 The environmental analysis shall include tradeoff considerations of the class of shipping and handling (probability of a loss, cost and schedule impact of loss, and cost of facility and carrier protection) versus cost of packaging and packing protection.

2.4.4.1 The following phases shall be considered:

a. In-plant storage, handling, and local transportation conditions and environments, both normally anticipated and contingency due to such emergencies as natural disasters, fires, spillage, and other accidents.

b. In-transit modes, normal and contingency environments.

c. Receiving, redistribution, handling, and storage conditions at the destination installation, range, test or launch facility including normal and contingency environments.

d. General guidance on transportation environments is available in Military Standardization Handbook 304, Package Cushioning Design. (Also see Military Standard 810 and Military Handbook 1791).

2.5 Packaging and Packing of Hazardous Materials

2.5.1 Department of Transportation (DOT) regulations listed in 49 CFR Subtitle B define Federal requirements applicable to shipments of hazardous materials, such as explosives or radioactive materials, within the United States. Shippers shall contact their export control offices as various international regulations may apply to international shipments.

2.5.2 In general, DOT's hazardous materials regulations are consistent with international regulations issued by the International Civil Aviation Organization (ICAO), ICAO Technical Instructions, which regulate dangerous goods (hazardous materials) shipments via air, and the International Maritime Organization, International Maritime Dangerous Goods (IMDG) Code, which regulates dangerous goods shipments via vessel. Shippers should consult the appropriate model regulations for the shipment.

2.5.2.1 Shippers who offer packages for transportation in compliance with DOT requirements, shall comply with provisions for hazardous materials classification, proper container selection, packing, marking, labeling, placarding, shipping paper preparation, emergency response information, training, and, in some cases, registration and security plan preparation. Additional packaging and packing requirements may be found in the General Provisions and the Safety Provisions of the contract and this NPR.

2.5.2.2 In addition to the requirements of this NPR pertaining to the shipment of hazardous materials, the applicable requirements of NPD 6000.1 and NPR 6200.1 also shall be complied with.

2.5.2.3 Transportation of hazardous materials shall be in compliance with applicable State and municipal rules and regulations.

2.5.2.4 All hazardous materials offered for military airlift shall be prepared in accordance with the requirements of Air Force Logistics Interservice 24-204. Packaging and packing requirements can be found in the General Provisions and the Safety Provisions of the contract and this NPR.

2.5.3 All persons who participate in any of the activities described in section 2.5.2 and 49 CFR 171.1 are defined as "hazmat employees" under 49 CFR Subtitle B and shall successfully complete training described in 49 CFR 172.704 at least every 3 years, and retain documents to provide evidence of that training..

2.5.4 Requirements for U.S. Government material, materials offered for transportation by, for or to the Department of Defense (DoD) or the Department of Energy (DOE), are listed in 49 CFR 173.7.

2.5.5 All items that are subject to ignition or detonation by electrostatic discharge shall be packed in bags manufactured from Military Barrier Material 22191, 121, or 131.

2.5.5.1 Some items may have additional packing requirements. Material used for additional packing to meet further static-generating discharge protection requirements shall conform to Military Barrier Material 81705 before such items are packed in bags made of Military Barrier Material 22191, 121, or 131.

2.5.5.2 Antistatic packaging material shall, in all cases, be intimate to the item.

2.5.5.3 The following notation shall be affixed to each unit package:

> WARNING:
> CONTENTS SUBJECT TO IGNITION OR DETONATION BY ELECTROSTATIC DISCHARGE. GROUND INNER ANTISTATIC WRAPPING BEFORE AND DURING REMOVAL FROM THIS PACKAGE.
>
> NOTE: THIS WARNING DOES NOT TAKE PRECEDENCE OVER OR SERVE IN LIEU OF REQUIREMENTS SPECIFIED IN APPLICABLE REGULATIONS AND TARIFFS.

2.5.5.4 Where considerations of precision, cleanliness, flammability, or compatibility with propellants preclude the use of antistatic material meeting Military Barrier Material 81705, Type II, contractors are authorized to use commercially available antistatic materials. Preapproval for such use shall be granted by the Contracting Officer or the Center Transportation Officer.

2.5.6 In addition to the regulations cited in section 2.5.1, further requirements regarding the packaging and transport of radioactive materials are contained in 10 CFR Part 71.

2.6 Degradation by Electrostatic Discharge

2.6.1 Many electronic devices such as thin or thick film resistors, semiconductors, field effect transistors, or circuitry containing any of these can be degraded by static electricity. The contractor shall ensure that design engineering identifies such items and provides the essential precautions to all in-plant handling and packaging personnel.

2.6.2 Items shall be packaged in accordance with section 2.5.5.

2.6.3 Each package shall bear a label warning that the contents can be destroyed by static electricity and shall be handled only by personnel instructed in the necessary precautions.

2.7 Kits (Parts and Modifications)

2.7.1 Preservation, packaging, and packing of kits (parts and modifications) shall be in accordance with MIL-STD-2073-1, Appendix D.

2.8 Weight and Cube

2.8.1 Accomplished packs shall be as simple as possible and of minimum tare weight and cube, consistent with the protection required.

2.8.2 Consolidation containers and pallets shall be properly used to reduce multiple handling

2.8.2.1 Items bearing the NASA Critical Item Label (NASA Form 1368) shall not be commingled with noncritical items in any container.

2.8.3 When the gross weight of the individual pack or consolidation exceeds 100 pounds or when the package cube exceeds 10 cubic feet, use of skids or pallets shall be considered.

2.9 Reusable Containers

2.9.1 Reusable containers are those that are designed to provide adequate protection when reused for return shipments and/or throughout several shipping cycles or sequences. Reusable containers shall be considered for all items that require periodic shipments to and return from repair activities and where adequate provisions to control the containers make reuse economical.

2.9.2 The quantities of reusable containers authorized shall be the minimum essential to meet anticipated needs.

2.9.3 The contractor shall identify reusable containers and provide storage to ensure their maintenance in a serviceable condition for use. The container specifications issued by the International Air Transport Association merit consideration for application to air shipping cycles. Requirements for reusable containers for U.S. hazardous materials shipments are defined in 49 CFR Part 173.28. Inspection and testing are typical requirements for reusable containers.

2.9.4 Existing reusable containers available commercially or from Government or contractor inventories shall be used to reduce package design and fabrication costs.

2.9.4.1 Modification of existing containers and container designs shall be considered when this is a cost-effective approach.

2.9.5 Multiapplication containers are especially useful for return of repairables since each size and type is suitable for shipment of a large number of different items within certain limits of size, weight, and fragility. These containers are described in MIL-STD-2073-1; Appendix E. Use of this type of container is authorized for Level A, B, and C applications where the multiapplication containers will provide equivalent protection to the contained item.

2.10 Reuse of Packaging Materials

2.10.1 Packaging materials may be considered for reuse to the maximum extent practicable.

2.10.2 The determination for reuse may be based on the quality and condition of the material, the economics of storage and handling of the used material, and the incidence of usage anticipated.

2.11 Disassembly

2.11.1 Disassembly of major components to facilitate packaging or to provide more effective procedures is permissible unless otherwise specified. Components shall remain assembled if previous inspection or test acceptances are invalidated by disassembly.

2.11.2 When necessary secure assembly hardware to one of the mating parts when disassembly is accomplished.

2.12 Matchmarking

2.12.1 When necessary to facilitate reassembly or repackaging, removed parts shall be match marked, unless otherwise required by directions or shipping instructions.

2.12.1.1 Matchmarking information shall be put on cloth shipping tags or on metal tags using waterproofed ink or paint, and attached to mating parts.

2.12.1.2 The marked cloth shipping tags shall be waterproofed with a water resistant spar varnish, a water-resistant paper label adhesive, or any other suitable colorless waterproofing material.

2.12.1.3 At no time shall tags or adhesive create interference with item reassembly.

2.13 Container Markings

2.13.1 Markings on unit packages, intermediate packages, and exterior shipping containers shall be in accordance with the applicable requirements of MIL-STD-2073-1 and this NPR.

2.13.2 Items designated as Class I, Class II, or Class III, in accordance with Appendix A, shall bear an appropriate NASA Critical Item Label (NASA Form 1368).

2.13.2.1 The label shall be affixed to each side, end, and top of the container.

2.13.2.2 Labels shall not interfere with other required markings.

2.13.2.3 Drums shall be marked with a label on the top and on opposite sides.

2.13.3 Shelf life terminal and preservation expiration dates shall be identified by marking, by tagging, or in log books as specified by design engineering requirements.

2.13.4 Marking and labeling of hazardous materials shall be in accordance with appropriate regulations as cited in

section 2.5 and with other contractual provisions.

2.13.5 Marking of hazardous materials needed for compliance with DOT regulations sshall be displayed on a background of sharply contrasting color and not obscured by other container marking or labeling per 49 CFR Part 172.304.

2.14 Testing

2.14.1 Testing of packages, packing methods, and materials shall be in accordance with design engineering requirements.

2.14.1.1 When specific design engineering requirements are not provided, tests shall be performed as specified in Appendix B of MIL-STD-2073-1.

2.14.1.2 In all instances, only standardized packaging testing techniques shall be utilized.

2.14.2 Shipping contractors shall ensure that all special testing data is furnished, as required by the contract.

2.14.3 Preproduction tests shall be performed in accordance with the design requirements of the contract. The necessity for such testing will be determined by considering the following factors:

a. The contractor has data or other evidence to indicate that prior successful tests were conducted and are accepted by the contracting officer as being equivalent to those now being proposed.

b. The packaged item has been subjected to similar tests as a part of other testing programs, as agreed to by procuring activity.

c. The container for a specific item of equipment is developed under an end-item specification, with engineering and testing approval through configuration management procedures and reviews.

d. Detailed packaging instructions are imposed by the procuring activity. 2.14.4 Provisions for the testing of hoisting and material-handling equipment shall be performed as required, per NASA-STD-8719.9.

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